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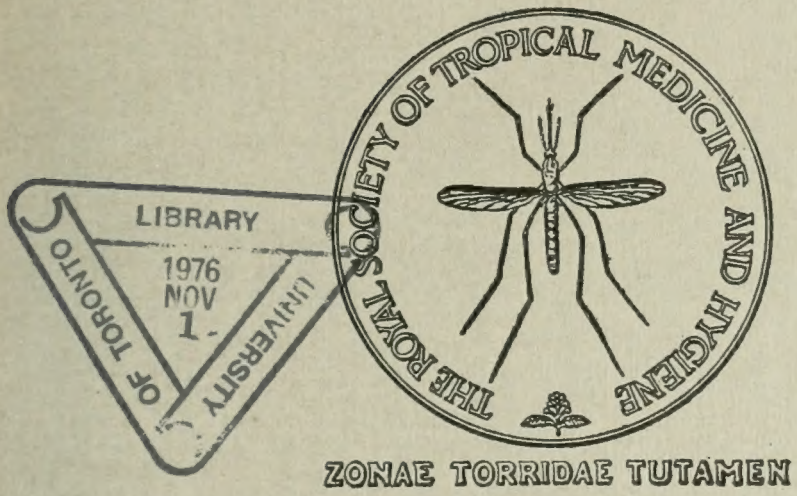
OF

THE ROYAL SOCIETY OF TROPICAL MEDICINE AND HYGIENE



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SOCIETY OF TROPICAL MEDICINE AND HYGIENE.

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SPECIAL NOTICE.

The next Meeting of the Society will be held on Friday, 21st February, 1919, at 5.30 p.m.

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The Editor of the TRANSACTIONS will be pleased to receive short papers to be included under the heading of "Notes and Comments," or "Questions," in addition to longer papers on subjects of Tropical interest, which may be offered for presentation at meetings of the Society. He will also be glad to receive books for review.

Attention is drawn to the rule that Contributors of papers to the TRANSACTIONS receive 25 reprints free of charge, *provided they apply for these when sending the paper.*

Any communication for the Editor should be addressed to THE EDITOR of the TRANSACTIONS of the Society of Tropical Medicine and Hygiene, 11, Chandos Street, Cavendish Square, W. 1.

TRANSACTIONS

OF THE

SOCIETY OF TROPICAL MEDICINE AND HYGIENE.

NOVEMBER 15TH, 1918.

VOLUME XII. NO. 2.

Proceedings of a Meeting of the Society held on Friday, November 15th, 1918, at 5.30 p.m., at 11, Chandos Street, Cavendish Square, W. 1., Surgeon-General Sir DAVID BRUCE K.C.B., F.R.S. (*President*), in the Chair.

SANITARY AND INSANITARY MAKESHIFTS IN THE EASTERN WAR AREAS.

BY ANDREW BALFOUR, C.B., C.M.G., M.D., TEMP. LT.-COLONEL R.A.M.C.

Director-in-Chief, Wellcome Bureau of Scientific Research

Necessity is the mother of invention, and war may well be termed the father of necessity, for certain it is that in war man is time and again in dire need. He has to make use of whatever material he can lay hands on. He has to set his wits to work to devise expedients. He has to invent and improvise on the spur of the moment to meet exceptional circumstances, and it must be admitted that his ingenuity is remarkable. If this is true of the combatant, as witness the tanks and hundreds of other marvellous devices, it is equally true, though on a more modest scale, of the Sanitarian. It has occurred to me that it may be of interest to the Society to consider some of the makeshifts of the army hygienist in hot climates. I have been privileged to visit all the important tropical and subtropical theatres of war, sometimes I fear as a kind of stormy petrel, and, thanks to Mr. Wellcome—who placed the resources of his Bureau wholly at the disposal of the War Office—I have been able to secure a large number of instructive photographs, some of which I propose to shew you, and which will serve as the text of a sanitary sermon. I may say that I was a member of the Medical Advisory Committee which visited Egypt, Mudros, Gallipoli, Salonika, Malta and Mesopotamia. I then accompanied Major-General PIKE, C.M.G., D.S.O., A.M.S., to East and South Africa. Finally, at the invitation of General ALLENBY, I went to Palestine to see the anti-mosquito operations there.

Like a sermon, the address is divided into heads for, contrary to the usual army view (I am not referring to the army *medical* view), sanitation is a very large subject, and I have no hesitation in saying it is, or should be, the most important branch of medical

work in the field. The term "medical," as here used, does not include surgery. It is a trite saying that prevention is better than cure. Everybody knows it, everybody seems to agree with it, but only a minority practise it, and that is why hygiene is, as I have heard it called, the Cinderella of the Medical Services.

Now, in army parlance, sanitation is still most unfortunately almost a synonym for latrines. It looks as if it would take half a century yet to drive this idea out of the minds of a generation which, thanks to faulty initial education, scarcely yet know how they live, move and have their being. It is a sad business, for it spells human lives and untold misery and grief and wretchedness; little crosses in lonely places, wrecked homes and a vast burden of expense and inefficiency.

Still there seems some prospect of better things, and one looks forward to the day when the sanitary flag will alter its hue and sport a mingled blue and white, the white of purity, the blue of hope.

Sewage Collection and Disposal.

For once, however, I will be fashionable, and give pride of place to the subject of sewage collection and disposal, the great importance of which no one will deny, though I would again forcibly protest against the prevalent idea that these duties sum up what is meant by army sanitation.

Different lands, different methods. What may do very well in Salonika is no use in Mesopotamia; what answers admirably in Palestine is hopelessly out of place in East Africa. The latrine very often must be devised to suit the locality. The latrine is, of course, the place of collection, and it may be temporary, or as permanent as anything could be in the kaleidoscopic war which—so far as hostilities are concerned—has just ended in so glorious a fashion. It may or may not be also the place of disposal. When this is *not* the case, there must be some form of special receptacle for the collection of urine and of excrement. There is also, as a rule, for reasons of decency and shelter, a building, and for reasons of comfort a seat, but, believe me, neither of those is a *sine qua non* in war. Let us, however, look for a moment at buildings and seats. We need not worry much about material. Anything may have to serve, from sacking on poles to corrugated iron. In Egypt, matting, or boorsh, as it is called, stretched upon a wooden framework, answered well. In East Africa, grass or reeds served the purpose (*Figs. 1 and 2*); in Mesopotamia, mud was ready for the moulding. One of the chief points about a latrine is that, however makeshift it may be, it should be provided with head-cover. That is not to say it should be completely covered over, but sufficient roof should be provided not only to shield the user from sun and rain, where rain occurs, but to ensure that the receptacle shall be in the shade (*Fig. 2*). There used to be, there still is, a cheerful idea that the tropical sun has merely to glow upon fæces for a few minutes to sterilise them, that nothing evil can live beneath its rays, that, so to speak, sunned fæces are safe fæces. Nothing could be further from the truth. Quite apart from the fact that the sun cannot do these things (you will doubtless remember that in the Punjab it has been shewn that typhoid bacilli can survive 23 hours of a sun drench), fæces with sun playing upon them are those upon which flies, and, at Basra, great brown and yellow hornets swarm and feed. In East Africa especially, I was struck with the contrast, though it is visible everywhere—the shaded latrine had few flies and they were scattered more or less, the sunny latrine swarmed with them and they were concentrated on the pan contents. All latrines therefore should be covered. Where it can be managed the walls should not come right down to the ground. It is in latrine angles that dirt collects, and the angle with the ground is one which can often be avoided (*Fig. 15*). Ventilation is easily secured by leaving a space between the roof and the walls. As a matter of fact most makeshift latrines are only too well ventilated. I have known some which resembled caves of the winds.

And now as to seats. It may be said at once that the less seat the better, for then there is the less to foul. The Indian, the Egyptian and the African native, thanks to their physiologically sound squatting habits, do not require seats at all, a very fortunate provision. The perverse European is fond, however, of providing them with seats.

What is the result? I recall the story of an ingenious person who made quite a mint of money in the old town of Edinburgh by attracting crowds into a modest building with the following outcry :—

> "A penny, a penny, a penny to see
> A horse with its head where its tail ought to be."

The expectant citizens found only a horse standing with its tail to the manger. Now this was unlikely to lead to anything very insanitary, but it is quite a different matter when one of the Egyptian labour corps carefully supports a falling latrine lid with his forehead, and deliberately ruins the aim and object of a portable fly-proof latrine admirably designed from a sanitary standpoint.

I hope to shew you various types of seats, and will then descant briefly on their faults and virtues. Of special interest is that constructed by the Boche for safari in East Africa (*Fig. 4*). It is in the form of a camp stool with two seats, the upper of a normal type, the lower fashioned as a latrine seat, and therefore possessing a suitable aperture with leather-bound edges. I fear it must be classed under the insanitary makeshifts, though it is ingenious and must add to the traveller's comfort.

We turn now to the receptacle. Rarely, very rarely, has the sanitary bucket, that pride of the Ordnance Department, been visible in large numbers (*Fig. 15*) There is really no need for it, thanks to the petrol tin and the petrol drum. Where we would have been without these aids to hygiene I cannot say. They have played almost as important a part in the war as the tanks.

The Macpherson system, with which you are doubtless all familiar, was much in evidence in Macedonia, and I have also seen it and, I grieve to say, smelt it in France. Theoretically, it is an excellent system. Under rigid supervision it may be a success. Practically it is a failure, human nature being what it is.

To some extent the receptacle must vary with the method of disposal. The pail system can be used either when trenching or incineration is employed; the half petrol can and other small collecting reservoirs are an integral part of the incinerating process. In temperate climates, when incineration is employed, the urine, passed when at stool, is a source of trouble, and must be separated from the solids. This is done sometimes in the tropical war areas but is rarely necessary. The quantity is much less, and with a good incinerator everything goes, as the sanitary corporal aptly puts it, to blazes! Still, at Aboukir, in Egypt, I saw a pail constructed on the principle of a colander, a double pail with the bottom of the inner bucket perforated to allow the liquid to drain away. Its solid contents then went to the fire. Another useful type is the Mackenzie pattern, where one petrol drum is slung inside another.

One of the best and most ingenious methods I have witnessed was in use at a carrier hospital at Dodoma in East Africa (*Fig. 5*). Here the metal vessels in which engineers carry earth formed the receptacles, and when full these latter were picked up by tongs and bodily thrust into the flames. In this way the contents were got rid of, and the receptacles sterilised at one and the same time,

Of all devices the sliding or drawer petrol-can is probably the neatest and best (*Fig. 6*). I shew you pictures of it, and you will see that it has several advantages. It fits close under the seat and cannot get out of place; it hangs suspended, and so the bottom of the tin does not get worn away, and there are handles which keep the sweeper from fouling his hands.

Of the making of incinerators there is no end. Nearly every sanitarian invents an incinerator, and the remarkable thing is that most of them can be made to work. I said "made to work" advisedly, for much more depends on the stoker than on the stokehold. The running of an incinerator is an art, and a good incinerator man should always receive extra pay. Another important point is that, whether he is good or bad, he should live close to the altar which he serves. How many times has one found a latrine neglected because a sweeper was away at lunch! Somehow one forgets that sweepers appreciate lunch like anyone else. Considering their work it seems a little hard to credit, but it is none the less true. To meet occasions of this kind, and also those where a deficiency in

sweeper personnel prevents prompt clearance of the tins, an assistant-surgeon of the Indian Medical Service in Mesopotamia devised an ingenious and yet simple method of covering the pans and their contents. Not only does it do so efficiently, but it overcomes the difficulty caused by the racial and religious prejudice of many Indian soldiers against touching anything unclean. Two metal hoops like croquet hoops are placed one behind and one in front of the double tins (for urine and fæces) supplied to Indian units. A long piece of sacking, which may be soaked in creosol or arsenite of soda, is attached by one end to the posterior hoop; the other, or free end, in which a piece of wire serves as a handle, being hooked up to the latrine wall. The user, after easing himself, detaches the sacking from the wall and lets it fall over the tins, which it shrouds like a curtain, but, being supported by the hoops, does not touch (*Fig. 7*). I saw this system being used successfully not far from Kut, but it is well to remember that "out of sight" is apt to be "out of mind," hence this scheme should only be employed to meet a special difficulty.

A great deal is said about the necessity of incinerators being provided with baffle-plates and combustion chambers. Where very large numbers of men have to be catered for, and where the vicinity is populous, this is, no doubt, necessary and desirable, but hundreds of incinerators which never possessed baffle-plates are doing good work to-day. I cannot describe them all at length, but I exhibit photographs of different types (*Figs. 8 and 11*), and direct attention to ingenious makeshifts, especially the tin and mud open "cone" incinerator for horse manure, as used in Mesopotamia, where, remember, there is practically no stone and plenty of scope for the inventor (*Figs. 9 and 10*).

One thing I would like to say: If at all possible, place your ordinary incinerator on a cement foundation (*Fig. 11*). Otherwise the ashpit is very apt to become a fly nursery. In Mesopotamia the number of fly maggots found living cosy if precarious lives under incinerators was amazing.

The motto of all who incinerate must ever be "from the pan direct to the fire," otherwise incineration may become a very dangerous method of disposal. The sweeper who mixes bhusa and fæces on the ground, and leaves the mass to the flies until he feels inclined to shovel it piecemeal into the fire, is only too common, and is a danger to the Forces (*Fig. 12*).

In Mudros I got one of Lumsden's home septic tanks—with which you are doubtless familiar—erected, and it worked quite well. I did not see another till I was at Potchefstroom, and there, at a demonstration centre, I obtained the photograph which I exhibit (*Fig. 13*). This is a cleanly method, and I understand that farmers in the Transvaal are now adopting it. As you know, it was originally introduced for the hookworm campaign in the Southern States of America.

And now a word as to latrines without receptacles.

The most familiar is, of course, the box-seat type with falling lids, placed over a deep trench. It has been in use on all the fronts I have visited, and one may say of it that when it is good it is very, very good, and when it is not it is horrid. In other words, when properly constructed, properly looked after and properly used it is an excellent sanitary contrivance. Too often, however, one or other of these desiderata is lacking, and then the trench below it becomes one vast breeding ground for flies. This is what happened in the Sinai Peninsula. The box-seats cracked and warped with the sun; they were not repaired, and flies soon found their way through cracks and holes and broken lids, attracted by the irresistible odour of the trench contents. To some extent this difficulty can be got over by constructing the box partly of corrugated iron, as was done in Macedonia (*Fig. 14*), but I fear the box latrine has not fulfilled the hopes of its admirers. There is, however, a modification of the system which has much to commend it. Set at intervals over a long deep trench, supported on iron rails, and provided with rims and covers or little box-seats with falling lids, are set a number of petrol drums, which serve as pedestal shafts to the trench (*Fig. 3*). The latter is roofed in elsewhere and covered by beaten-down earth. Such a system certainly lessens the risk of fly infection, but, to make assurance doubly sure, a certain German doctor long ago invented the smoke method, and in many parts of E. Africa one encountered the smoke latrine. The principle is simple, and is shewn in the photo. (*Fig. 22, smoke urinal*) and drawings. Here, again, however, care and supervision are

necessary. I remember a certain officer commanding a hospital, who led me with pride to see his smoke latrine. The lid was removed, the smouldering mass of leaves and wood, evolving pungent fumes, was lowered in the brazier, and immediately, with a loud and angry buzz, there emerged green Lucilia, grey Sarcophagidæ, blue Calliphora, swarms of small Muscidæ, and all the flies which should not have been there but which, owing to neglect, had got a chance of gathering to the feast.

The river Euphrates and its fish played the part of receptacles at Chabaish in Mesopotamia (*Fig. 16*).

Units on the march have no time for elaborate latrines. They have to employ comparatively shallow trenches. Now, if these are not protected at the time of use, and not properly filled up and treated after use, other units following after will be plagued with flies and possibly with dysentery. Hence the value of what may be called the portable-plank method. Each unit should carry these creosoted or cresoled planks, of which you will note the dimensions, and use them as temporary trench covers, alternate planks being removed, and the men straddling across the gaps and replacing the planks (*Fig. 17*). A guard must be posted to see the operation is properly conducted. Full details are given in the "Memoranda on War Diseases" issued by the War Office.

Lastly, I shew you a naval improvisation, the type of latrine for native troops, adopted after much tribulation on the Victoria Nyanza steamers. It is merely a framework, covered with cloth or tarpaulin, projecting from a port (*Fig. 18*). It effectually prevents fouling of the vessel's sides.

A few other points and we turn to a more savoury subject. As you know, the Indian practises "abdust" or lavage, and it is very important that he should do so under sanitary conditions. Here is the best scheme of many that I have seen (*Fig. 19*). A square pit is dug and filled nearly to the surface with tins or rubble. It is then covered over, but a hole is left on each of its four sides. Sloping channels, lined with tin, lead to each of these holes, and the Indian, straddling across the channel, performs his ritual *sans peur et sans reproche*.

The question of field urinals need not detain us. They vary from the ubiquitous funnel—at first mistaken for a listening-post (*Fig. 20*)—to the East African ant-hill, which has most marvellous absorptive powers (*Fig. 21*). A smoke urinal has also been employed —rather an unnecessary complication (*Fig. 22*).

Food and Cooking.

I suppose it seems heresy to say so, but I am convinced that the excellent health of the troops on the Western Front is quite as much due to the indefatigable efforts of the Army Service Corps as to those of the Royal Army Medical Corps, speaking for the moment merely as regards the question of transport and distribution of food. I am sure that many officers of the Medical Corps will agree with me. It stands to reason. Feed a man well—that is, give him plenty of good food in sufficient variety, adapted to his racial peculiarities, to the climatic conditions under which he is serving, and well cooked, and in the great majority of cases he will defy not only the Boche but the bacillus. I am certain also that, anti-mosquito precautions and preventive inoculation excepted, good food and proper cooking are more important sanitary measures than any others in the field. Where were they not forthcoming? In Gallipoli, Mesopotamia and East Africa. What war areas have had the greatest disease incidence, the highest mortality? Gallipoli, East Africa and Mesopotamia. To this day it is not fully realised that questions of food and cooking are scientific questions—that the advice of dietetic experts should invariably be sought and followed. If this were done, one would not see ration scales for native African troops devoid of substances essential to life and health—one dietary without sugar, another minus vegetables. It seems scarcely credible, but it is true. Now cookhouses are important places. In the earlier stages of the war everyone tried to make cookhouses flyproof, with the result of converting them into flytraps. Anyone who was at Mudros will confirm this statement. It is no use employing wire netting in a cookhouse unless you have double doors, can execute instant repairs, and can post a sentry to shoot those who put stones under the doors to keep them open. No, a cookhouse must be well ventilated, as dark as possible, and its door should face north in the northern hemisphere and south if it is on the other side of the equator. All this sounds trivial, but at Lindi, in East Africa I saw

a cookhouse on which many pounds had been spent, and it was worse than useless. On the other hand, I shew you a fenestrated mud-brick cookhouse, of most excellent design, which I saw near Jaffa (*Fig. 23*). It is a new and original pattern, well worthy of adoption, designed by Lieut.-Colonel OTWAY, R.A.M.C.

The photographs shew you all kinds of open-air kitchens and field ovens. Much ingenuity is often displayed in their construction. The same is true of field-bakeries—most important institutions in which very often wonderfully good bread is baked. Believe me, good bread often means good health, for, as you know, bread is the "staff of life."

I direct your attention to the plan of an underground larder used by a crack cavalry regiment in Mesopotamia (*Fig. 24*). While their comrades spoiled their teeth and their tempers on tough meat, this unit enjoyed tender roasts and stews throughout the fiery heat of a Mesopotamian summer—a fitting reward of enterprise.

Professor SIMPSON, at the last meeting of the Society, paid a tribute to our gallant allies, the Serbians. I saw a good deal of these fine peasant soldiers just after they reached Salonika from Corfu. We had a great deal to learn from such veteran campaigners. While our men too often "pigged it" in their tents—many units at that time having no mess marquees or huts—the Serbians dined in comfort at stone tables under an awning of tree branches, which they collected from a place eight miles away (*Fig. 25*). You will see their stone serving tables (*Fig. 25*), their kitchens, and the officers' dining-table and seats of wicker or basket work (*Fig. 26*), both comfortable and picturesque.

WATER SUPPLIES AND WATER PURIFICATION,

Lack of space prevents any reference to the hundred and one contrivances for dealing with sullage water in hot countries, but the photographs shewn speak for themselves. Of more importance is the question of water supplies and of water purification. The sources of supply varied greatly on various fronts. Egyptian filtered water, brought by tank steamers, was the chief supply in Gallipoli; in Salonika, mountain streams were often a source; in Palestine, the sources varied from the beautiful "Springs of the Sultan," near Jericho, to the clear waters of the rapid Auja river, which flows into the sea near Jaffa, and included the new reservoir supply for Jerusalem, gathered from the hills about Bethlehem. In Egypt, the Nile and its canals furnished the supply, and brought risks of bilharzia; in Mesopotamia, a dry and thirsty land, the Shatt-el-Arab, the Tigris, the Euphrates, the Karun, and surface wells yielded their waters, sometimes with the cholera vibrio in them; in East Africa, men drank from rivers and from water-holes, from mountain streams and from wells, and ran many risks in consequence, for the makeshifts devised for protection were too often well worthy of the name. Let us look at some of them and at methods of collecting, transporting, storing and purifying water on various fronts. Putting a strand or two of barbed wire round a water-hole, and placing a native sentry on guard over it, are measures of slight futility, though better than nothing. Where possible, a high fence should surround the spring or pool, with a hole in it through which the collecting hose passes This was done at Summit, on the Mikese-Rufiji road, in East Africa, and answered excellently (*Fig. 27*). At Amara, in Mesopotamia, the admirably protected well areas with covered wells were one of the sanitary features of the place, and a tribute to the Royal Engineers.

The only special device for collection which I will mention is the use of the huge fruits of the baobab tree as pitchers when drawing water from wells. Methods of pumping, more or less elaborate, are shewn on the screen.

Storage is often a troublesome business, especially in a country like Mesopotamia, where for a long time transport was a great difficulty. That is one reason why large rubber canvas troughs, each holding 2,300 gallons, came into use (*Fig. 28*). Their only drawback was that they were not covered. Tanks hollowed out in the soil, lined by tarpaulin and covered with canvas, were common in the Advanced Corps Area, in 1916. I have seen drinking-water stored in a German shell-case, which makes an excellent receptacle. Unfortunately someone had placed the long metal cylinder in the blazing sun and the water was scarcely refreshing. Even makeshifts must be properly used. A very bad type of watertrough was the canvas diggie made in Basra—a clumsy, heavy, leaking arrangement.

Water was transported in many ways: by carts, in pakhals and fantasses, on mules and camels, in bags, in petrol-tins as at Anzac (*Fig. 29*)—a weary business, but I do not recall any very novel devices, save the use of iron telegraph poles as pipes at Sheikh Saad in Mesopotamia, and of split date-palm trunks as water-gutters.

As regards purification. In some places I have seen river water boiled in petrol tins on the bank, and all the good of the boiling vitiated by the transport people plugging the openings in the tins with bunches of grass or reeds—a very insanitary makeshift (*Fig. 30*). On the other hand, an Indian hospital had an admirable arrangement whereby water was sterilised in special boilers and gravitated by tin channels to metal receptacles (*Fig. 31*). At Port Amelia, in Portuguese territory, a British hospital adopted the principle, but placed the receptacles up hill from the boilers, and so the boiled water had to be carried up to them by hand, an element of risk being thereby introduced. As has been truly said, common sense is rare sense.

Two makeshifts for preparing good emulsions of chlorinated lime are worth noting, both employed in Basra. The earlier one consisted in Indians violently shaking Winchester quarts filled with the solution (*Fig. 32*); the latter was represented by ingenious hand-churns, and worked very well (*Fig. 33*).

Elaborate improvised labyrinths were at one time in vogue in the Suez Canal zone to ensure a thorough mixing of water with alum, and thereby a satisfactory precipitation prior to filtration. The design reminded one of the maze at Hampton Court. A sergeant-major at Amara effectually prevented thirsty souls from drinking out of a tin dipper, and thereby possibly contaminating a water supply, by serrating the edge of the tin (*Fig. 34*); while a good method of cooling water employed in Macedonia was to surround a water-tank with sandbags, which were kept wet, an air space being left between the bags and the tank.

Bathing and Washing.

Great ingenuity was often shewn in the construction of shower-baths, but nowhere more so than in the Corps Area in Mesopotamia, where the absence of wood and stone resulted in the remarkable tin structures, a picture of which I shew you (*Fig. 35*). The simplest makeshift, however, was at Morogoro, in East Africa, where by hollowing out the ground a stream was made to cascade and thereby supply a splendid douche (*Fig 36*). The damming up of natural watercourses often resulted in the provision of excellent baths (*Fig. 37*), and a fine swimming-pool was created by the use of a huge metal tank employed in the soda works at Wady Natrun in the western Egyptian desert. The ordinary ablution bench was very unsatisfactory until one genius thought of adding a rail, on which coats and shirts could be hung (*Fig. 38*). Previously these garments, like "Uncle Pete's hat," had been hung on the ground, and were very apt to get dirty and wet. Talking of cleaning, the plan of scrubbing steamers' decks on the Victoria Nyanza with half cocoa-nut shells came as a revelation to me, and is probably new to most of you.

Disinfection is closely allied to bathing and includes the destruction of vermin. The simplest makeshift for dealing with clothes lice is probably the oldest—the picking method—carried out either by the sufferer or a friend. I shew photographs illustrating both operations, the first taken in the front line trench at Anzac, where the picker was much more interested in his prey than in bullets flying overhead (*Fig. 39*); the second secured in Amara, and rather reminiscent of monkeys at the Zoo (*Fig. 40*). But we can do better than this in the army, and you will find illustrations varying from the Serbian barrel to the most useful railway van disinfector, which of all methods I have seen accomplishes most in the shortest time, as you will find if you peruse Col. Wm. Hunter's articles in the *Lancet* for Sept. 14 and 21, 1918. Both these useful methods owe their introduction to Lieut.-Col. Stammers, R.A.M.C. Now the Serbian barrel is often wrongly used. What is the use of placing it on a hillock and having to climb up to it every time soldiers' kits have to be popped into it (*Fig. 41*)? Again, why do so many people neglect to see that the water-tank, the source of steam, is so placed below the barrel that the largest available evaporating surface is provided? Success in sanitation depends largely on attention to detail, and very often this is not forthcoming.

The so-called Levisseuse apparatus, which is a kind of metal Serbian barrel, has such a limited holding capacity that it is not much use.

A barrel may be used for holding disinfectant outside a latrine. It should be accompanied by a nail brush fastened to a wire. One medical officer actually arranged a latrine in such a way that once in it you could not emerge without dipping your hands in a disinfectant solution which effectually camouflaged the latch of the door. I fear the plan was more ingenious than effective.

A very insanitary makeshift for getting rid of dead animals on the road was too often in vogue in East Africa, namely, leaving them there till the flies and the vultures made an end of them. I show you the picture of a carcase where, it is true, an effort at charring had been made, but in which the main disinfection was that whereby Herod Agrippa ceased to be a nuisance, for this dead horse was being "eaten up of worms," or rather by the maggots of Pycnosoma flies.

Fly Destruction.

I do not like to call any invention of my own a makeshift, but would like to direct your attention to the open-air cage fly-trap (*Fig. 42*) and to its modification by Capt. Rose. Both these models work well when properly baited and operated. This is not the case when medical officers construct them so as to catch sparrows as well as flies, or alter them according to views which effectively ruin their efficiency, or pay no attention to them after the first excitement of trapping several thousand flies is over. Here are the rules which must be followed if these traps are to be a success:—

1. The calico or canvas forming the greater part of the sides of the trap should be stretched *tightly* on the framework.
2. The slit between the wire mesh and the alighting board should be just large enough to allow a bluebottle fly to enter the trap.
3. The trap should, as a rule, be placed in the sun out in the open.
4. It should be placed outside a mess or cookhouse, or near a latrine, or between an occupied tent or camp and any source of flies.
5. It is essential that it should be properly looked after, especially as regards baiting.
6. For this purpose it is best placed under the charge of some one person who will be responsible for keeping it in repair, baiting it properly, and cleaning it.
7. Any attractive bait may be employed, but one of the very best is chicken entrails. Human fæces may be used if placed in a tin carefully covered with wire gauze, so that the flies cannot get access to the contents. Other baits are:—raw meat, cheese paste, stale beer, bread soaked in vinegar water, jam, marmalade, lentil paste, with a little sugar sprinkled on it, old melon rinds, fruit and fish refuse.
8. Flies in the trap are best killed by having a poison solution such as formalin 3 per cent., made up with lime water, arsenite of soda syrup, or sodium fluoride.

   Whatever poison is used it is best placed in a covered tin, through the lid of which wicks protrude. These wicks dip down into the fluid or syrup which they suck up, and the flies imbibing the poison from them speedily die.
9. Failing poison, the flies can be killed by spraying with spray oil or some similar preparation, or by fumigation, the trap being covered over with cloths or blankets during the fumigating process.
10. A record should be kept of the daily catch. This may be done by weighing the flies or seeing how many will go into a receptacle of known capacity. A pint measure holds about 10,000.

It is perhaps news to many that a tangle-foot fly paper is much more efficient if used in the form of an arch; sticky surface of course upwards (*Fig. 43*). This has probably something to do with the way the light falls upon it, and an apparatus has been devised for holding such curved papers.

The roller towel method of using arsenite of soda solution is an excellent makeshift arrangement, and, with a minimum of attention, ensures a constantly damp, poisoned surface for the delectation of our enemy the fly (*Fig. 44*)

At Nasiriyeh, on the Euphrates, Major Patten, I.M.S., had introduced Roubaud's

1.—Native Latrine (uncovered), K.A.R. Lines, Tabora.

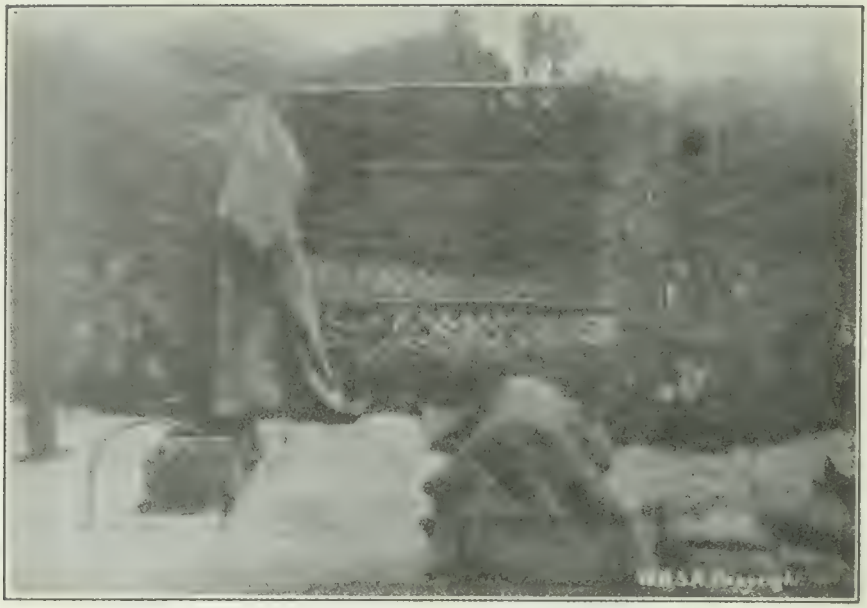
2.—Latrine for Dysentery cases in process of construction, Port Amelia.

3.—Bad type of trench latrine, Dodoma. The seat is uncomfortable and too high, there is no roof, and the covers of the cylinders leading to the pit are defective.

4.—Adaptation by the Germans of Camp-stool for use as Latrine Seat.

5. - Method of Incineration practised at Carrier Hospital, Dodoma. -The faecal receptacles held by tongs are plunged bodily into the fire. These metal receptacles are those used by engineers for carrying earth.

6.—Sanitary Demonstration Centre, Basra, shewing in foreground types of Fly-proof Latrines with petrol tins suspended from sliding runners. The seat-cover on the right is badly arranged. It falls back too far to be self-closing.



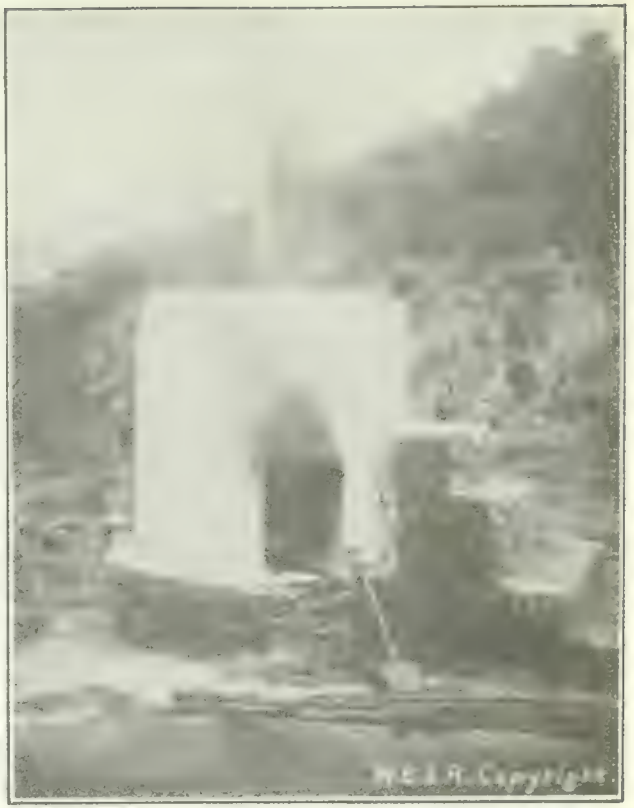
7.—Method of protecting pan contents in Indian Latrine from flies, as shewn at Sanitary Demonstration Centre, Dar-es-Salaam.

8.—Battery of Sugar-loaf Incinerators, Amara. Note proximity to latrine.

9.—Open Cone Incinerator for Horse Manure. Constructed of petrol cans, small tins, wire and mud.

10.—Open Cone Incinerator being used for the burning of manure.

Photographs 9 and 10 by Captain P. F. GOW, D.S.O., I.M.S.



11.—Incinerator placed on Cement Base to prevent fly-breeding.
3rd S.A. Field Ambulance, Summit, East Africa.

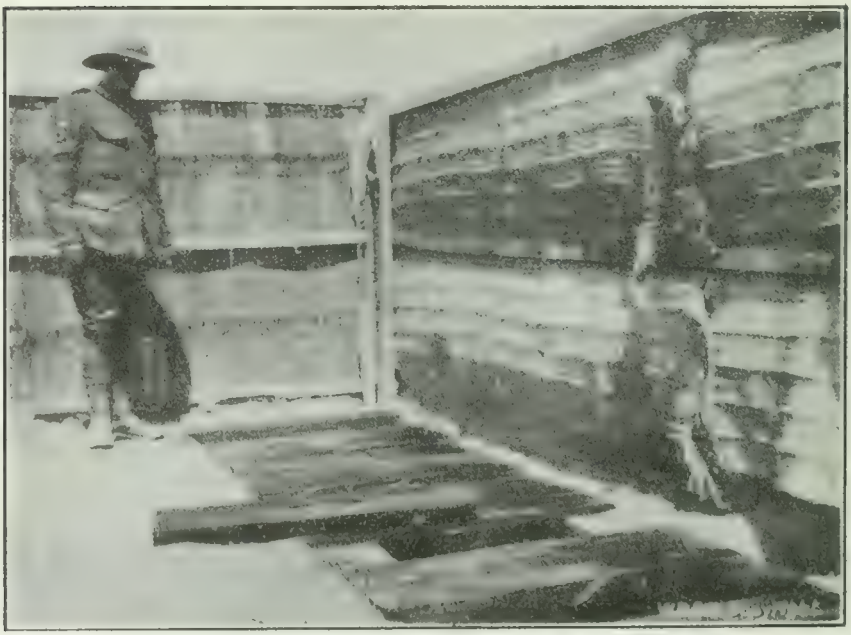
12.—Mud-brick Incinerator, river post near Amara. The sweeper is shewn mixing bhusa and human excreta. The mass is often left for a considerable time before being fed to the Incinerator, and in this way flies gain access to it.

13. Improvised Lumsden Wet Privy or home septic-tank method for dealing with excreta. Note fly-proof seat, closet barrel and effluent barrel. There is an anti-splash arrangement inside the closet barrel. Sanitary Demonstration Centre, Potchefstroom. Urine funnels seen in background.

14.—Fly-proof and Wind-proof Box-seat Latrine, partly made of Corrugated Iron.

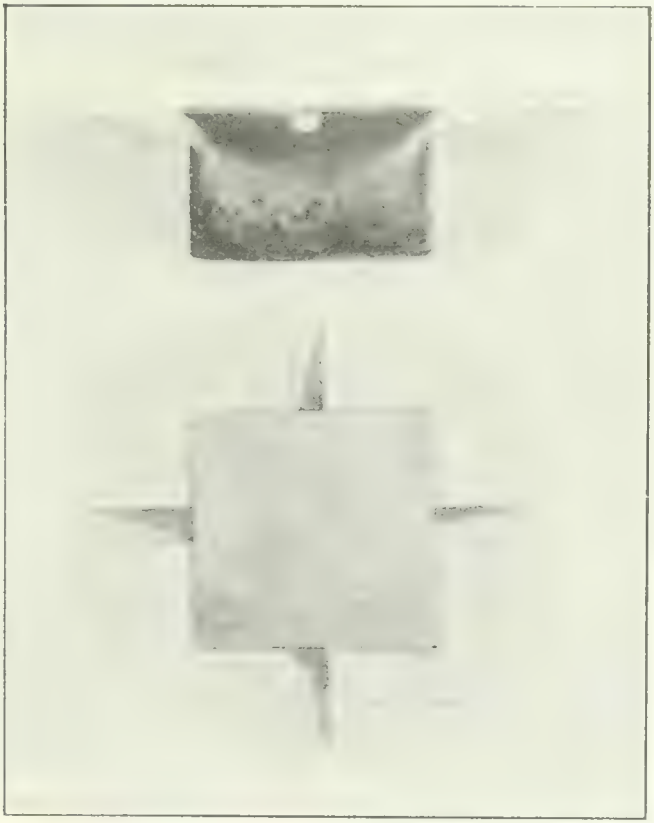
15.—Good type of Fly-proof Latrine, Australian Camp, Tel-el-Kebir. Separate pails with falling lid on each pail. Note litter at the angle formed by the ground and the wall of the latrine.

16.—Latrines for British Units built out over a creek, Chabaish, Euphrates.



17.—Temporary Latrine covered by Oiled Boards set side by side. This form was employed owing to proximity of strongly brackish subsoil water to ground level, Kantara, Canal Area.

18. -The s.s. "Usoga" on Victoria Nyanza, shewing Latrine arrangement for native troops.



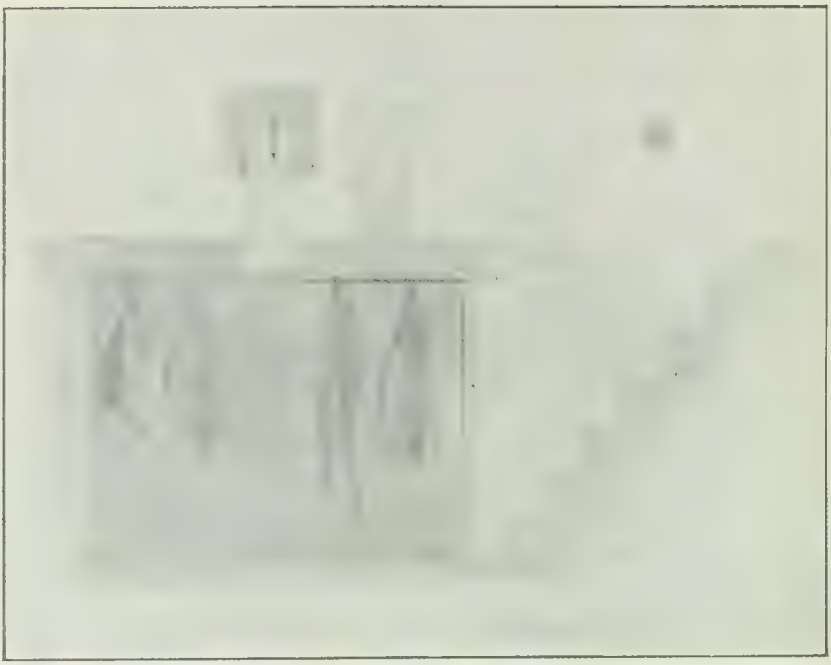
19.—Good type of Covered Lavage Pit for the use of Indians.
Note channels which are lined with tin.

20. Urinals communicating with soak-pit. One shews flap to prevent dripping on ground.

21. Large Ant hill used as Urinal, Dar-es-Salaam.

22. [illegible] Camp Hospital, Iringa, shewing method of lowering brazier

23. [illegible]

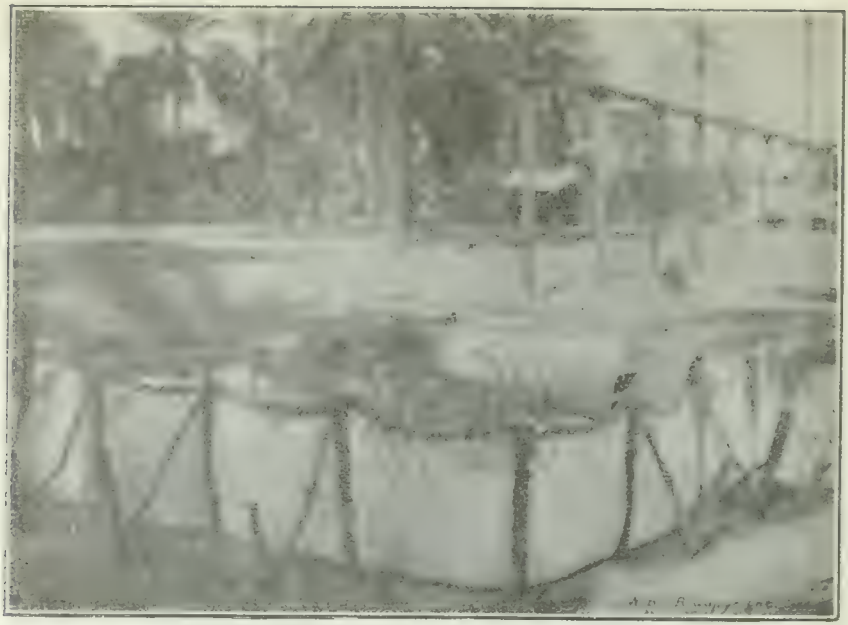


24.—Method of keeping meat, and ensuring that it was tender, employed by a Cavalry Regiment in Mesopotamia.

25.—Improvised Messing Area. Dining-tables and serving-tables made of stone. Roofed with leaf shelter. Serbian Army.

26.– Improvised Dining-table and Seats for officers of Serbian Army. Made of wicker-work.

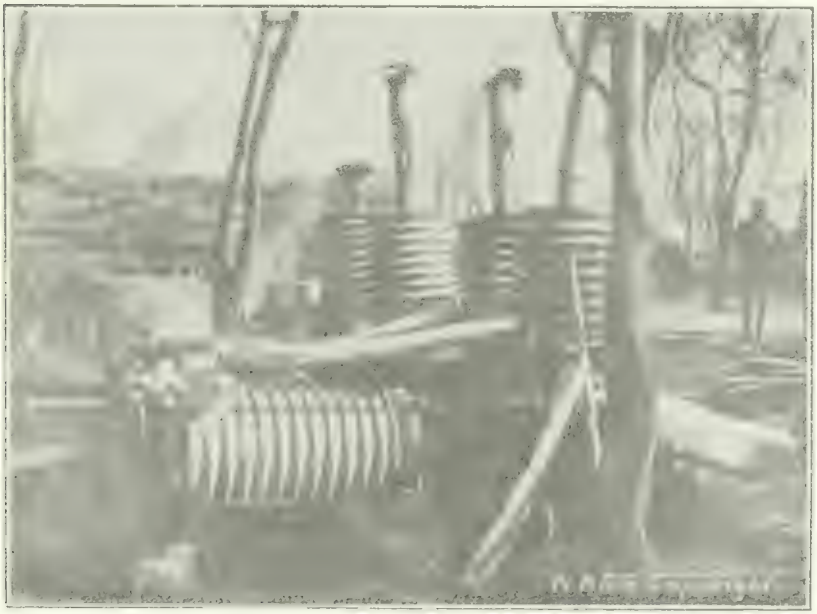
27.—Well protected "swing" water supply of Serbian Army. Arrangement for loading the water tank.



28.—Rubber Canvas for holding Drinking Water. These canvas tanks hold 2,300 gallons.

29.—Water Transport in Petrol Tins. Note small Turkish well. Clark's Gully, Anzac.
The trenches are on the top of the hills seen in the background.

30.—Unguarded Water Supply, River Mbemkuru, Nahungu, shewing collection in petrol tins in which water is boiled on the spot.



31.—Water Boiling Apparatus, Indian Clearing Hospital, Nahungu.

32.—Old Method of Preparing Chlorinated Lime Solution for Water Sterilisation. Indian orderlies shaking bottles. Basra.

33.—New Method of Preparing Chlorinated Lime Solution for Water Sterilisation by Use of Churn.

34.—Persian Hub and Dipper, shewing method of serrating the edge of the latter to prevent men using it as a drinking-vessel. No. 23 British Stationary Hospital, Amara.

36.—Improvised arrangement for native ablution, No. 15 Stationary Hospital, Morogoro.

35.—An improvised Shower-bath made from petrol-cans and wire. Highland Nullah, Tigris Front.

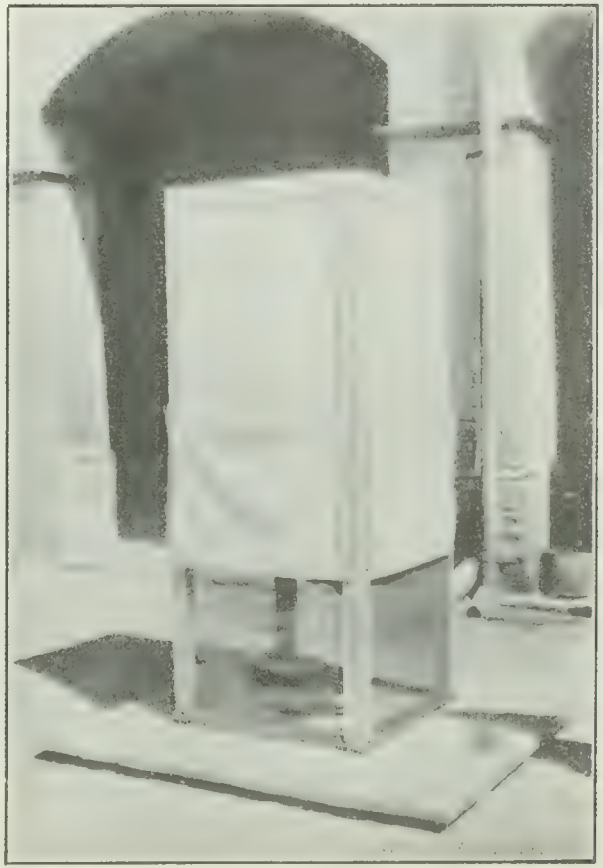
37.—Improvised Bathing-place, Macedonia, formed by damming up the course of a mountain stream.

38.—Ablution Bench furnished with rail for hanging clothes.

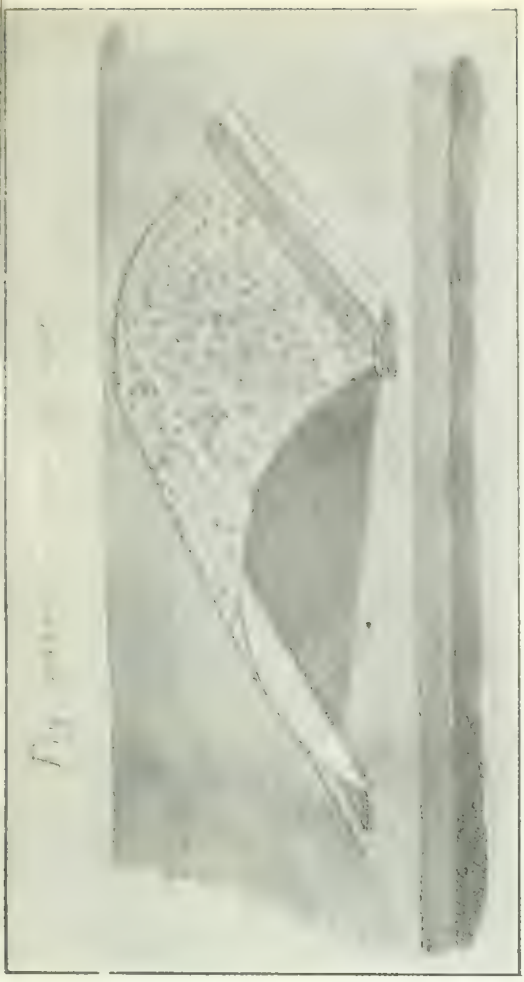
39.—Primitive method of removing Lice. Front line trench, Anzac.

40. [illegible]

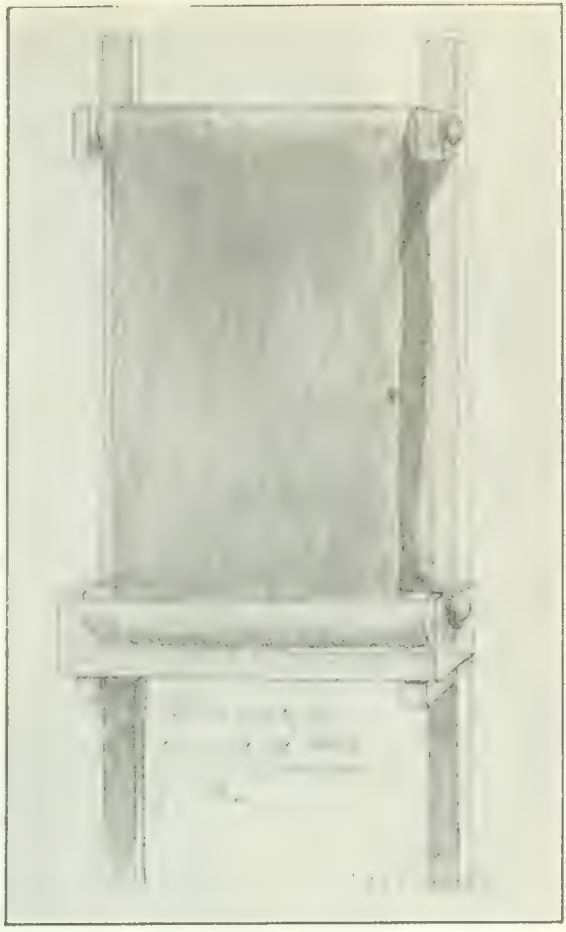
41.—Serbian barrel wrongly placed, making it difficult to insert kit in the barrel owing to height above ground level.



42.—Latest type of Cage Fly-trap, in use at Basra.



43.—This arched form of Fly-trap is found to serve as a more efficient trap.



44.—The Trough in which the sacking dips contains the poisoned solution.

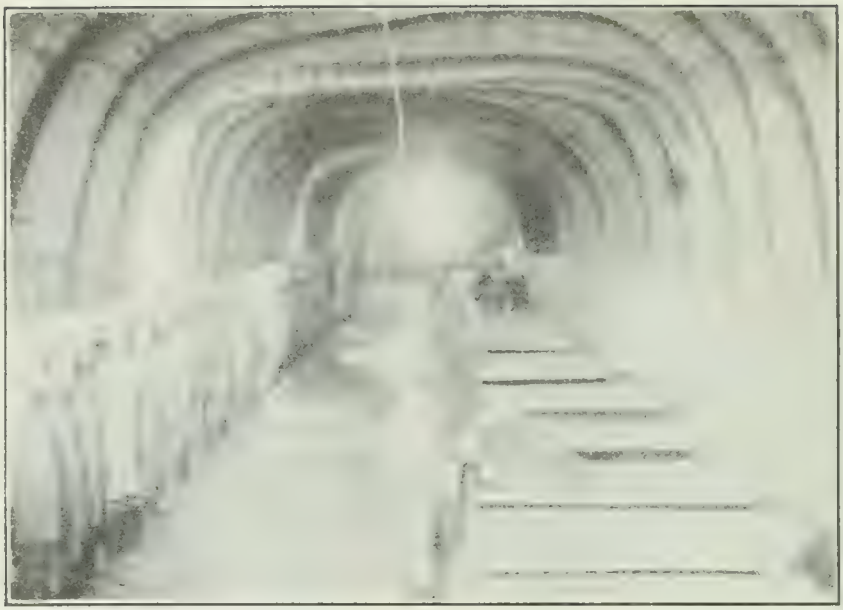
45.—ROUBAUD'S method for the Destruction of Fly Eggs and Larvæ, shewing mounds of manure. Grid and other Incinerators are also in evidence.

46.—Exterior of Fenestrated Mud-brick Mosquito and Fly-protected Ward, of No. 130 Combined Field Ambulance, on the road north of Jaffa. Designed by Lieut.-Col. OTWAY, R.A.M.C.

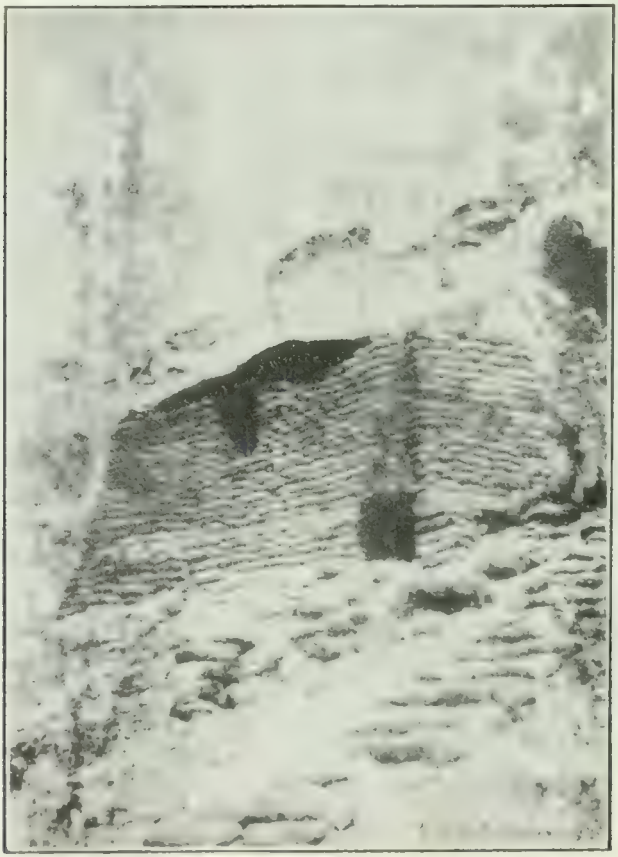
47.—Part of 124th Indian Cavalry Field Ambulance, Jordan Valley, shewing Sick under Grape-vine in Monastery

48. -Separate Hut Shelters for Cerebro-Spinal Fever contact cases, Carrier Hospital, Dodoma, East Africa.

49. Exterior of type of Hospital Hut at the British Convalescent Depot, Amara. These huts of reed and chatai matting are hollowed out in the ground to a depth of four to five feet. Lateral openings provide light and air. They are comparatively cool in summer.



50.—Interior of type of Hospital Hut at the British Convalescent Depot, Amara. These huts of reed and chatai matting are hollowed out in the ground to a depth of four to five feet. Lateral openings provide light and air. They are comparatively cool in summer.



51. Sandbag Bacteriological Laboratory at base of cliffs, Cape Helles.

method for destroying fly eggs and larvæ in horse manure, and the remarkable mounds here shewn are the result of his efforts (*Fig. 45*). The heat of the manure is used as a lethal agent. Another device, which served to free a large hospital at Potchefstroom altogether of flies, was introduced by Lieutenant BABER, S.A.M.C., and has been described in the *Lancet* for March 30th, 1918. Here the larvæ migrating from the heap were trapped in gullies and destroyed, and any flies which happened to breed out found leafy branches soaked in arsenite solution conveniently placed for their refreshment and rest, the latter of the eternal variety.

BUILDINGS.

Lastly, a few words as to buildings. By far the most ingenious makeshift hospital ward I ever saw, was the fenestrated mud-brick erection constructed by Lieut.-Colonel OTWAY, R.A.M.C., of the 130th Combined Field Ambulance, on the road running north from Jaffa. I shew you external (*Fig. 46*) and internal views. Thanks to the use of mosquito mesh on the inner side of the fenestrations, and also over the doors and windows, this ward was absolutely free from flies and mosquitoes. It was partly hollowed out of the ground, but the portions left as bedsteads were of such a height that the patients lying on them could look out of the ward and see all that was passing. There was plenty of light and yet it was refreshingly cool. As I say, I never saw anything like it, and it deserves very honourable mention.

Some of the thatched bandas used as wards in the carrier hospitals in East Africa were truly works of art. Those in No. 1 Carrier Clearing Hospital at Iringa were really beautiful buildings and most comfortable, reflecting the greatest credit on Major ROBERTS, R.A.M.C., and his experienced architect, Staff-Sergeant EALES, S.A.M.C. I shew you the interior of one of them.

A trellised grape vine in a monastery close to the Jordan formed quite a good makeshift ward for the patients in an Indian Cavalry Field Ambulance (*Fig. 47*), while I would direct attention to the curious little shelters for cerebro-spinal contacts employed at Dodoma in East Africa (*Fig. 48*).

A method of warming a tent by a stove and chimney was in use on the Karun Front in Mesopotamia; and, at Amara, the remarkable huts of the British Convalescent Depot dug out of the soil, roofed with reeds and provided with lateral ventilating shafts, were admired by all who saw them, and used by as many as could get into them (*Figs 49 and 50*).

Finally, I may remark that no one who was ever inside the famous sand-bag bacteriological laboratory, tucked away out of shell-fire at the base of the cliffs at Cape Helles (*Fig. 51*) is likely to forget it, and that the remembrance of the huge packing case which had once held an aeroplane, doing duty at Dar-es-Salaam as an hospital laboratory, is not likely to fade.

I think I have said enough to prove that the army sanitarian has plenty of ingenuity, even if it is at times wrongly applied. Believe me, he has need of it, for he is often left in the lurch. Why is this the case? There are several reasons, but one is that the sanitarian has to go cap in hand to the Ordnance Department or the Royal Engineers and beg for material. Sometimes he will get it at once, sometimes after a long time, very often not at all. Let me tell you a true story which speaks for itself:—

A New Zealand medical unit on a certain island was badly in need of wood for sanitary purposes. Requisition after requisition failed. Finally, the Commanding Officer said to his Quartermaster, "I want you to indent on the Ordnance for a large supply of wood to make tombstones!"

"Tombstones!" said the Quartermaster, "what do we want with tombstones?"

"Never you mind," was the reply; "do as I tell you."

Next day a cart, laden with wood of all shapes and sizes, made its appearance. There was plenty for the dead. There was none for the living.

Naturally enough the engineers, a very busy and capable corps, scarcely realise the paramount claims of sanitation. Like Martha, they are occupied with many things, and latrine construction does not usually appeal to them, nor do they always understand what is meant by efficient protection of a water supply. As I have said elsewhere, things will

not be right until the Royal Army Medical Corps has affiliated to it a body of expert sanitary engineers, under its own control, to carry out the minor sanitary works which are so important. I know there are difficulties in realising such a scheme, but I believe they can be overcome.

In common with many of you, I have the honour to belong temporarily to the Royal Army Medical Corps, and I have seen again and again how the efforts of that corps are frustrated by its dependence on other departments. Too often it gets the blame when it is not blameworthy. Grant it a greater measure of autonomy and you will see what it can do. They say medical men are not, as a rule, good administrators. I deny that assertion. What are the qualities of a good administrator? Foresight, tact, discretion, firmness, energy and sympathy. What is prognosis but foresight? What is tact if a doctor does not learn it in dealing with his patients? Discretion is surely drummed into the medical man from his student days. He may not always be firm, but his experience at least teaches him to stiffen his back if he is to save life. Few men lead more energetic lives than the medical student, while sympathy is surely the hall-mark of our profession.

No, the doctor can administer if he only gets a fair chance.

At the same time I do not think that hygiene is yet priced at its proper value. I would advance a plea, an urgent plea, for its better recognition. Rightly or wrongly, decorations play a great part in army life. When a regular officer is introduced to a stranger in khaki, in nine cases out of ten his eye wanders first to the spot where what has been called the "herbaceous border" flourishes! He will never there see anything associated with sanitary work—I mean it has no distinctive reward. Comparatively rarely indeed has it any reward at all.

And yet the disciples of the goddess Hygeia—be they in the humblest or the highest positions—contribute greatly to the success of our arms, more especially in tropical countries. They have hard work, constant work, often dirty, dangerous and repellent work. Doubtless it is sufficient honour and reward to labour for the sake of the empire; but when so many distinctions are conferred, is it asking too much that the claims of the sanitarian should be considered, not, mark you, for his own sake, but to impress upon those ultimately responsible the fact that army hygiene is a very important section of army life?

Our friends the French are a wise and practical people—the French army has such a distinction. I understand it has been cheapened; but I maintain the principle is sound, and the recipients of any such honour should not be limited to the Medical Service, but should be chosen wherever an officer or man has shewn conspicuous zeal and energy in furthering sanitary measures.

There are many other questions of pay and rank, and, I may add, as far as sanitary sections are concerned, of mobility, but into these I may not enter.

I would only say that if ever the above suggestion—which I advance with considerable diffidence, and only because I am certain it is on right lines—if ever, I say, it bears fruit, then I hope the ribbon chosen for the decoration will bear the same colours as the flag of which I spoke—the white of purity, the blue of hope.

Discussion.

Colonel William Hunter: It has been my experience for two and a half years to be intimately acquainted and concerned with the conditions in the Balkan and other Eastern war areas—so well epitomised by Professor Simpson, and with the measures, sanitary and insanitary, adopted, so well summarised and illustrated by Colonel Balfour, with whom it has been my great privilege and pleasure to be associated in the work of the Advisory Committee for preventing epidemic diseases in the Eastern war areas.

During that experience nothing has impressed me more than the up-hill difficulties that had to be faced by the sanitary officers of the army, the number and variety of the problems of prevention they had to face with inadequate means, the number and variety of improvisations they had to create to enable them to carry on their work, and, lastly,

subject to the limitation connected with the above difficulties the remarkable degree of success which always attended their efforts *after these difficulties had been overcome*, both by concerted and individual initiative.

The magnitude of these difficulties was indicated in the figures given with regard to Gallipoli, viz., over 96,000 sick evacuated in the course of seven months in the autumn of 1915. The nature of these difficulties could, however, only be appreciated by those on the spot called on to deal with them. They were of a unique character, connected in the first instance with strategic considerations which necessitated the original landing, and the subsequent holding on to positions which gave no rest of mind or body, by day or by night: in which all landing of supplies had to be carried out in the hours of darkness on an open shore, without even landing piers; in which there was the greatest dearth of all material necessary for sanitary services; in which even the water supply—limited to a gallon or at most two gallons a day—had to be largely brought overseas from Alexandria or the Millwall Docks, London; and, lastly, in which all supplies were subject to loss by submarine attack: *e.g.*, at a critical moment a shipload of much needed material and appliances for sanitary work was thus lost.

To these circumstances were added those not only of utter fatigue of body, but plague of heat and flies and dust, which only those on the spot, as I myself have been, could fully realise.

The net result was the figure of sickness above quoted, made up chiefly of dysentery and diarrhœa (50 per cent.); "enterica" (typhoid and paratyphoid), (10 per cent.); supplemented later by "epidemic jaundice" (3 per cent.); reaching their maximum in September and October.

The figures were approximate, and served to indicate the magnitude of these infections that had to be dealt with in Gallipoli. They also indicated the degree of possible infection which was imported by the troops when evacuated to Egypt in January, 1916, and the problem of prevention which presented itself, both in that area and also in the Salonika area, during the following two years, where the work of the Advisory Committee lay. The result known to me was the following:—

Enterica.—During the year 1916, in Egypt, with twice, and, for a period, more than three times the number of troops, the incidence of enterica was checked from the very outset. It fell from its figure of 1,000-2,000 cases a month in Gallipoli (December, 1915) to about 400 a month in Egypt in the first quarter of 1916; about 250 a month in the second quarter, about 150 a month in the third quarter, about 70 a month in the fourth quarter, and, finally, to about 20 a month in the first quarter of 1917, at or near which very low figure it has since remained - a striking tribute to the value of inoculation.

Dysentery.—The fall here—uncontrolled by inoculation, as was the case with enterica—was also most striking: the total number of cases in the year 1916 being only about 6,000.

The general result was described by the War Office in official communications of July 7th and 11th, and August 11th, 1917, as follows:—

Egypt.—"The health of the troops in Palestine is very satisfactory. Admissions to hospitals due to sickness for the first four months of 1917 shew a decrease in the annual ratio amounting to 145 per 1,000, as compared with the same period in 1916. The present ratio is lower than the average for Egypt during the five years preceding the war."

Salonika (July 12th and August 11th, 1917).—"With regard to the health of the force, this year (1917) compares very favourably with the last. The health of the troops shews a marked improvement. In proportion to the strength of the force, admissions to hospital during July, 1917, shew a reduction to one-third compared with July, 1916; and deaths, from all diseases, a reduction of nearly two-thirds.

"Dysentery and diarrhœa are appreciably less prevalent. The admission rate for fever, other than malaria, shews a reduction of nearly four-fifths.

"The following table shews the number of cases of sickness per 1,000 men during the four weeks ending June 23rd, 1916 and 1917:—

	1916	1917
Dysentery and diarrhœa	20·55 ...	6·87
Enteric	0·37 ...	0·02"

The above figures served to present the other side of the shield, viz., the results of preventive medicine work in the field, brought about, under difficulties, by the indefatigable labours of officers of the Sanitary Branch of the R.A.M.C. Although the status given to this sanitation branch of field work in the R.A.M.C. is probably higher than in most other armies, the experiences of the war had revealed in an exceptional manner the great, and, indeed, *primary* importance of this class of service. Its importance, I think, is not sufficiently indicated by the term "sanitary," applied to it, a term which in the general mind has come to be associated—all too exclusively—with the question of latrines and other measures of conservancy, and does not do full justice to the wide number and variety of problems, in all branches of science, which had to be faced in carrying out preventive medicine work in the field.

The title of "preventive" seems to me best to connote at once the character and the importance of that work—which more and more included not only knowledge of conservancy methods in the field, but a wide knowledge of branches of knowledge: entomology, bacteriology, protozoology, tropical diseases, etc., not covered by the term "Sanitary."

Various methods by which fuller recognition could be given to this branch of work had been touched on or suggested by the writers of the papers, and were worthy of fullest consideration.

Whatever organisation of this branch of the service might be adopted, an important precedent consideration in my judgment is to indicate by the title of the branch, viz., Preventive Medicine, the precise scope and importance of its work, coequal and coextensive with the great allied branch of hospital work concerned with the treatment of disease.

Numerous, and ingenious, and intensely interesting as were the inprovisations now necessary to carry on preventive work in the field, so well illustrated by Colonel BALFOUR in the demonstration he has given, it should be possible, in the light of our recent experiences, so to standardise our measures and *especially to arrange for their supply*, that dependence on hand-to-mouth methods need no longer be necessary.

The great sister branch of hospital work has not to improvise its supplies of beds, blankets, and material (tents, etc.), necessary for its work, but is supplied with these in abundance as required.

The needs of *Preventive Medicine* work in the field might well be and could be supplied by similar arrangements, which would give it full scope for its work, and not leave it dependent, as it now largely is on the supplies and mercies obtainable from so many other branches of the service—A.S.C., Ordnance, Engineers, as the case may be—upon whom so many and pressing demands come from all sources.

Professor W. J. R. SIMPSON: I congratulate Colonel BALFOUR on the graphic account he has given the Society of the sanitary and insanitary makeshifts he has encountered on his mission at the various centres of war. His experience is unique, and his recommendations for that reason will be most valuable to the Army. By his excellent and humorous description of the conditions which he saw, and which are well brought out by the photographs, he has managed to demonstrate, without offending any susceptibilities, some of the grave defects in the sanitary organisation of the armies in the East, and at the same time he has supported the views which I put forward at the last meeting.

Colonel HUNTER referred to the many difficulties, owing to the military situation, which preventive measures had to encounter. I am fully cognisant of these, but I am strongly of opinion that so far as the sanitary difficulties are concerned they need not have occurred, and that had an effective sanitary organisation existed, even in the case of Gallipoli--where it was found afterwards that no difficulty need have arisen in regard to a good supply of water and other sanitary considerations there would not have been the terrible amount of sickness that prevailed.

Until the value of the work done, and which can be done, by the officers and men engaged in sanitary work, is more appreciated than it is even at the present time, there will be little chance that the organisation required to preserve the health of our armies

will be given that importance and position which are needed for its efficiency. It must be acknowledged that a great advance has been made since the Boer war. The view, however, which Lord Wolseley held, and which found its way into the military Pocket Book, when sanitary officers were first appointed to the Army, that it was a sanitary fad, is still too prevalent among some people, and not infrequently acted on. Until this notion is thoroughly uprooted, and encouragement, promotion and honours are given to the Sanitary branch of the Service, in the same proportion as to other branches, there will be lacking the same enthusiasm for it. I have, however, great hopes that the experiences which Colonel BALFOUR, Colonel HUNTER and others have had of the defects of the preventive side of medical organisation in this war in the East, will result in great changes being effected on the lines I have indicated.

Then, in the next war—for I am not one of those who believe that war is going to disappear from the face of the globe—there will be a sanitary organisation ready, which will, as soon as war breaks out, send its Chief Health Officers and Staff, with material and powers of administration, to go forward and work in conjunction with the other military staff officers.

I am sure that in this way we shall have a much healthier army, and no repetition of the Gallipoli and Mesopotamian disasters

Lieut.-Col. A. CASTELLANI: I should like to congratulate Professor SIMPSON and Colonel BALFOUR on their very interesting papers.

In 1915-16 the Balkanic war zone was a hotbed of disease. In the early part of 1915 typhus was ravaging Serbia, one-tenth of the population was killed off by this scourge, one-third of the Serbian doctors died of it, and numerous victims occurred, too, among the medical men and nurses who responded to Serbia's call for help.

Relapsing fever was extremely common, and often was seen in patients recovering from typhus, this being due, of course, to the same insect carrying the two diseases.

Of malaria there were innumerable cases. I think I can say I saw more malaria in the Baltic zone in the two years I was there than in the sixteen years I was in tropical countries. The disease was extremely polymorphic, and could practically simulate any disease I know of. The treatment was difficult; it was doubly difficult there owing to the scarcity of quinine.

Typhoid, and especially paratyphoid, were quite common. I may, perhaps, be allowed to mention that the Serbian army adopted my combined vaccinations before any other army. Of Pappataci fever there were true pandemics. The dysenteries were extremely common. In fact the Balkanic zone was devastated by tropical diseases, and could be considered from a medical point of view to be a tropical country. Let us have a look now at the present condition of the same zone; nobody can deny that great progress has taken place. This progress is certainly due to the efforts of the medical departments of the British, French, Italian, and other allied armies, as well as the magnificent work done by men like Professor SIMPSON, Professor STRONG, Colonel HUNTER, and others.

Captain ANGUS MACDONALD: I thank Colonel BALFOUR for his most interesting paper, especially for its evident sympathy with the work of the practical sanitarian; and I ask the permission of the Chairman to put before the meeting a resolution in the name of Colonel Sir RONALD ROSS, who regretted his inability to be present: "That this Society forward direct to the Lord Chamberlain a copy of the paper of Colonel ANDREW BALFOUR, having marked the passages therein referring to a sanitary decoration."

Colonel S. P. JAMES: As one who has been much concerned with sanitary organisation in both peace and war in the tropics, I have read Professor SIMPSON'S important paper with much interest. I am heartily in accord with his view that in tropical campaigns, even when we possess the knowledge which would enable us to prevent disease, the application of this knowledge usually fails from lack of an adequate sanitary organisation separate from the organisation primarily intended for curative needs. In this connection

I hope it may not be out of place to make a few remarks upon the campaign in Mesopotamia, to which in January, 1916, I was deputed by the Secretary of State for India for the purpose of endeavouring to remedy certain grave defects on the sanitary side which came to light about that time. On this mission the late Dr. SANDWITH was to have accompanied me, but unfortunately for reasons of health he was unable to take up the appointment. I may preface my remarks by saying that in Field Service Regulations it is laid down that the first function of the personnel of the medical service is to preserve the health of the troops, and that in the Mesopotamia campaign this duty was especially important and urgent because (*a*) never before had so large an army operated under such unfavourable climatic and other natural conditions; (*b*) cholera, typhus, typhoid, relapsing fever, malaria and other epidemic diseases were endemic among the local inhabitants, and might at any time become so prevalent as almost to annul the fighting efficiency of the force; (*c*) many of the officers and most of the men were unacclimatised to tropical conditions, and had had no previous experience of campaigning. For these and other reasons it was to be expected that the necessity for a strong sanitary organisation would have been recognised in the beginning of the campaign. I found, however, on my arrival in February, 1916, that this was not the case, and that the urgency and importance of the sanitary and preventive branches of the medical services had been largely overlooked owing to *undue focussing of attention upon the purely curative branch* Sanitary sections had been depleted by detailing the personnel for duty in hospital; officers appointed for sanitary duties were being employed on routine office work; sanitary sections were in charge of very junior officials, who were without the necessary qualifications for this specialised class of work, and were without previous tropical experience; in general there was a complete failure to realise that for preventive as well as for curative work the staff must be proportionate to the work required.

In these circumstances the first task was to define the principles of the sanitary policy that should be followed, the second to create an independent organisation by which that policy could be carried out. In defining the sanitary policy we acted on the principle that the work required for preserving the health of the troops includes:

(*a*) Arrangements for obtaining intelligence regarding all influences affecting the health of the army.

(*b*) The preparation of a code of sanitary measures and rules based on the information supplied by these arrangements.

(*c*) Executive arrangements for carrying out the measures and rules.

(*d*) Arrangements for constant inspection to see that the measures and rules are everywhere carried out.

In creating the organisation for carrying out the policy, we laid stress on the view that sanitary administration and control can be efficient only in so far as it has expert inquiry and research for its starting point, basis and guide. Our line of action was, first, to detail expert sanitary officers and bacteriologists to investigate and report on actual conditions and needs at different parts of the line and in regard to different epidemic diseases; second, to formulate from the reports of those officers uniform measures to be adopted throughout the force, thereby to make such executive arrangements as would ensure the measures being carried out. I wish to emphasise that in providing the staff and means for carrying this line of action into effect, we had to neglect entirely sanctioned war establishments, and to provide an organisation entirely new to army medical regulations. Time does not permit me to give details of the organisation, so I will only say that the staff for the Central Administrative and Intelligence Branch, included a statistical officer, a sanitary engineer, two medical officers of health, a chemical analyst, an entomologist, and six special inquiry officers who were expert bacteriologists. Local intelligence and executive arrangements were also made without reference to sanctioned war establishments, and I believe the campaign was the first in which, in the tropics, an adequate sanitary organisation has been established quite separate and distinct from the organisation for purely medical needs. The arguments by which we were successful in obtaining an organisation for which there was no precedent, and which at first sight appeared unnecessarily large, were, first, that the conditions under which the force was operating

were altogether unexampled; second, that there were enormous possibilities of disasters if disease among the troops got beyond control; third, that the sanitary requirements asked for were relatively very small in comparison with those always considered essential for the curative side of the medical service.

Captain J. Graham Forbes: I am in complete agreement with Professor Simpson's criticism of the conditions under which the sanitary officers are called upon to carry out their important duties in connection with camp sanitation and water supply. And particularly in countries such as the Balkan area, where they are faced with the difficult problems of organising and supervising preventive measures against malaria and dysentery in dealing with the mosquito and fly pests, I would emphasise the vital necessity of sanitary officers being provided with proper authority and military rank. After two years' experience in Macedonia I recognise only too well the difficulties of efficient sanitary work without these very necessary powers.

The hospital unit in which it fell to my lot to undertake the duties of sanitary officer was the first of several sent out to be attached to the Serbian army. On arrival at Salonika we were apparently quite unexpected, and the object of our coming seemed to partake of the nature of a surprise. No arrangements had been made as to our destination, and there was consequently some delay in settling on the choice of a site. Decision was eventually arrived at as the result of a day's trip up the line, some fifty miles in the direction of Monastir, by the officers in command of two units, under the guidance of the French authorities, and the only possible camping ground out of several inspected was selected at the end of what must have been a particularly trying and hot day. The choice of a site was necessarily dependent on strategic conditions, but, as events proved, suffered from a hasty and imperfect acquaintance with the particular locality. The chief advantages attached to it were the close proximity of the main railway and road to Monastir towards the west of the allied line of defence.

Arriving as we did in midsummer, it was most important that immediate steps should have been taken to attempt to carry out some scheme of anti-malarial measures and drainage, but owing to insufficient supply of labour and other causes it was impossible to put in hand any serious or co-ordinated effort to remove or reduce the danger of malaria, which was to take heavy toll of hospital patients and personnel.

It was not until the late spring of 1917 that the Mission Antipaludique Française, together with the augmented working parties of the sanitary sections of the two units, was able to take the problem in hand of draining the surrounding areas and clearing the dense growth. These efforts bore fruit in the summer and autumn of 1917 and 1918 in a considerably diminished incidence of fresh cases of malaria, and this diminution was undoubtedly assisted by the freer use of mosquito netting in the men's lines, the issue of which in 1916, and until late in 1917, having been quite inadequate.

In addition to their anti-malarial measures in the terrain, the French mission carried out investigations into the incidence of malaria among the natives of the surrounding villages, and ascertained the spleen index among children to vary from 40 to 70 per cent. of all those examined. Quinine was also administered to all those whose blood showed the presence of parasites.

Water Supply. A better acquaintance with the locality at the time the site was originally chosen would have ensured a far more satisfactory supply than we were able to depend on. For at the foot of the hill-slopes, some three miles across the tongue of plain from the selected site, was a copious spring of good water of constant volume issuing from the limestone rock and flowing in a series of pools to join a main river. The spot, moreover, was free from swamp and risk of flood, and therefore provided less breeding ground for the mosquito. The cost of communication with rail and main road would have been inconsiderable compared with what had to be incurred in furnishing a means of supply from the small source on which the camps in the chosen site were dependent. This source was a small spring which came to the surface some 300 yards from the hospital boundary and followed the course of an old Turkish aqueduct for a short distance before discharging into a small basin two feet in diameter, and was thence carried off into one of the many little streams.

Sanitation.—The sanitary officer was, unfortunately, not ordered to accompany the party sent in advance of the unit to prepare the camp site. His duties, therefore, commenced under difficulties, with a very insufficient labour staff.

Being dependent on the French authorities and situated at a considerable distance from Salonika, there was much delay in the provision of materials to construct latrine sheds. In the meantime, and for a period of three months, we were obliged to rely solely on the latrine trench system, which required unceasing watchfulness to insure the free use of earth covering.

After the lapse of three months the permanent latrine sheds, with concrete flooring, were complete, and provided with portable drums or buckets with lids.

Experience soon taught that the simpler the system for the Serb the better the chance of an approach to sanitary cleanliness. The plank seat and back-rest, fitted in well-meaning spirit by the French engineer, proved to be not only superfluous, but put to wrong use, which led to much fouling. Both were, therefore, eventually removed, and the Serb was able to adopt the attitude he was most familiar with, free from the hindrances of a supporting seat.

For the disposal of excreta it was not found practicable to incinerate, and the simpler plan was adopted of removal in the Crowley Cart for burial in large pits about a mile from the camp, where free use was made of cresol and chloride of lime each day to disinfect the contents, surface, and sides of the pits. Excreta from the dysentery and enteric wards and latrines used by convalescents from those wards, in addition to being treated with cresol, were boiled in a large vat in the annexe to the special latrine, and the boiled residue was removed by the cart for burial with the rest of the camp excreta. Large boxes with compartments for sanitary bins, containing cresol solution, were provided in the annexe for disinfection of bed-pans and infected linen, and a special boiler was also used for further disinfection of pans and linen. The linen was then removed to the Thresh disinfector for steam sterilising.

Solid camp refuse was collected in sanitary bins and petrol drums and disposed of at first partly by burial in pits—a very unsatisfactory system—and partly by incineration; but as soon as it was possible to build several incinerators of closed pattern all solid refuse was burnt.

It was at first thought possible to dispose of liquid refuse by means of soak pits, but owing to the lack of absorption by the clay soil and the high level of subsoil water the soak pits rapidly filled up, and for this reason they also proved quite unsuitable for urinals. In the case of urinals it was found best to provide petrol drums well cresolised, and to remove the urine by the sewage carts for burial with the rest of the excreta in the pits a mile from the camp.

The liquid waste from kitchens and bathing tents was at a later date collected in a special soil cart for emptying into one of the streams at a distance from the camp—a tributary of the river which eventually emptied itself in the marsh several miles to the east. The separation of liquid from solid refuse was a constant source of trouble, for both British and Serbian orderlies alike were very slow to realise the impossibility of burning the wet sodden mass that was frequently brought to the incinerator. Similarly the liquid soil cart, and in early days the soak pits, were frequently choked with solid refuse, in spite of notices and instructions to the contrary, and the provision of separate bins labelled respectively "solid" and "liquid" refuse in both English and Serbian

Flies and the Camp Surroundings.—The fly problem in the East is one of, if not *the* most difficult and harassing of tasks which beset the thorny path of the sanitary officer. The conditions surrounding the camps during the summer and autumn months after our arrival in July, 1916, offered every attraction to the winged pest invading our lines, and taxed the energy and vigilance of our sanitary section to the utmost. Both in kitchens and latrines the daily use of cresol solution by means of spray and broom proved of great value in reducing and keeping away the flies. In the wards and mess tents a spray solution containing 1 per cent. formalin, carbolic and eucalyptus was found to be fairly effective as also the use of fly papers and wire fly traps. Unfortunately owing to the regulations in force, arsenite of soda was not available, and sodium salicylate and formalin

solutions placed in open dishes proved of practically no use. In the immediate vicinity were small camps occupied by some of the allied units and by Macedonian labourers where the standard of sanitation left much to be desired, and necessitated frequent visits for the removal and abatement of nuisances responsible for the attraction and propagation of the fly pest. Likewise the encampment in the neighbourhood of troops of almost every nationality and of passing natives greatly increased the chances of fly prevalence and infection. During the subsequent summer and autumn, 1917 and 1918, anti-fly measures were rigidly enforced, and the marked diminution in the numbers of flies was generously attributed to these efforts, but was more probably largely due to climatic and seasonal influence of a prolonged drought.

Col. W. G. KING: A perusal of the papers by Professor W. J. SIMPSON and Lieut.-Col. A. BALFOUR leads to the conviction that whilst on the Western Front with but little movement of the troops, and with their bases practically in England, sanitary efforts have been eminently successful, this cannot be said to be the case in certain of the subtropical and tropical areas in which military operations were conducted. The conditions which existed, in spite of the loyal efforts of the officers concerned, could not be satisfactorily met by the sanitary service of the Army as organised.

Professor SIMPSON suggests desirable and reasonable administrative reforms; Colonel BALFOUR deals with the logical outcome of such reforms in rendering sanitary efforts no longer dependent on the concurrence, or forethought, of the Ordnance or Engineer Staffs. Both hold that while there should be close intercommunication between the curative and sanitary branches of the Army Medical Service, each should be self-contained.

The administrative recommendations of Professor SIMPSON are compatible with the practical opinion of Colonel BALFOUR, that an essential part of a scheme of reform shall be that the Sanitary Branch of the Service shall have under its command a technically trained body of men, capable of relieving the Engineer Corps fully of duties connected with minor sanitary works - as contrasted, I presume, with major sanitary works which would fall to that Corps, in consultation with the Sanitary Service.

Obituary.

Dr. R. P. COCKIN.

We regret to announce the death on December 9th, 1918, of Dr. Reginald Percy Cockin, a fellow of the Society from 1908.

Dr. Cockin was born at Hull in 1879, and studied at Cambridge, taking his M.A. degree in 1906 and his M.D. in 1913. His medical studies in London were carried out at the London Hospital. After graduating in medicine he acted as casualty house-surgeon of Hull Royal Infirmary, and after that entered the West African Medical Service. He was appointed district surgeon in Southern Nigeria, and later on medical officer of the Niger Cross expedition in 1908–1909. In 1910 he was transferred to Cyprus, acting here as a district medical officer and examiner under the Pharmacy Act. In 1913 he was posted to Grenada, West Indies, where he held the posts of resident surgeon to the Colonial and Yaws hospitals and also did bacteriological work. After this he joined the Staff of the London School of Tropical Medicine In 1915 he was appointed a temporary Lieutenant in the R.A.M.C., and went to Egypt with Lieut.-Col. Leiper and Captain J. G. Thomson to study bilhariasis. After his promotion to Captain, owing to ill health, he was obliged to resign his commission, and resumed his duties at the London School of Tropical Medicine. He was appointed Assistant Medical Entomologist, and assisted Colonel Alcock in his duties as Deputy Director of the School in the absence of Lieut.-Col. Newham, the Director, on service in East Africa.

When the special venereal clinics were formed in London by the Local Government Board, Dr. Cockin initiated and started the one at the Albert Docks Hospital, and acted as its Director. He quickly built up a large practice and made it a great success.

Dr. Cockin attended the meetings of the Society regularly, and took a lively interest in the papers read before it. Of a retiring nature, he did not speak much during the discussions, although his wide tropical experience gave him every right to do so. He was a keen and hard worker, and his knowledge of tropical medicine was well exemplified in the excellent reviews he used to contribute to the *Tropical Diseases Bulletin*. As one of the younger men in Tropical Medicine, he had a future before him, and his loss will be severely felt by his colleagues at the London School of Tropical Medicine as well as by his numerous friends elsewhere.

The following is a list of his published works, that on the treatment of yaws by salvarsan being a very important contribution :—

"A Further Report on Work Done in Connection with Ankylostomiasis at the Colony Hospital, St. George's, Grenada (Windward Islands)." Report to the Secretary of State for the Colonies, July, 1912.

"Report on the Treatment of Twenty-two cases of Yaws, by Salvarsan Injections, at the Yaws Hospital, St. George's, Grenada, W.I." *Jl. Trop. Med. and Hyg.* 1912, Sept. 16. Vol. XV., No. 18, pp. 277–278.

"Ankylostomiasis in Grenada," *Parasitology*, 1913, Apl. Vol. VI., No. 1, pp. 57–67.

"Treatment of Yaws by Intramuscular Injections of Salvarsan." A Report on a Series of 45 cases treated at the Yaws Hospital, St. George's, Grenada, B.W.I." *Lancet*, 1913. Dec. 6, pp. 1609, 1610.

"A Case of Rat-Bite Fever Treated Successfully by Injections of Novarsenobillon," *B.M.J.*, 1918. Feb. 16, pp. 203, 204, with Dr. G. C. Low.

LIST OF FELLOWS.

The following were duly elected Fellows of the Society:—

J. Graham Forbes, M.D, M.R.C.P.

Capt. H. H. King, M.B., I.M.S., Bombay.

EXCHANGES.

Anales de la Academia de Ciencias Medicas Fisicas y Naturales de la Habana.
Annali di Medicina Navale e Coloniale.
Annals of Tropical Medicine and Parasitology.
Archives de l'Institut Pasteur Tunis.
Arquivos do Instituto Bacteriologico Camara Pestana.
Bulletin Public Health and Marine Hospital Service of the U.S.
Bulletin of the Tropical Diseases Bureau.
Bulletin de la Société de Pathologie Exotique.
Bulletin de la Société Portuguaise des Sciences Naturelles.
Bulletin de l'Academie Royale de Médecine de Belgique.
Het Geneeskundig Tydschrift voor Nederlandsch-Indie.
Illinois Biological Monographs.
Indian Journal of Medical Research.
Indian Medical Gazette.
Johns Hopkins Hospital Bulletin.
Journal of the Royal Naval Medical Service.
Journal of the Royal Army Medical Corps.
Journal of Tropical Medicine and Hygiene.
Journal of Tropical Veterinary Science.
L'Enseignement Medico Mutuel Internationale.
Memorias do Instituto Oswaldo Cruz.
New Orleans Medical and Surgical Journal.
New York State Journal of Medicine.
Philippine Journal of Science.
Revue de Médecine et d'Hygiene Tropicales.
Sanidad y Beneficencia.
Veterinary News.

NOTE.—The above publications lie in the Society's room at 11, Chandos Street, W., 1, and are at the disposal of Fellows.

J. C. PHELP AND SON, PRINTERS, BEULAH ROAD, WALTHAMSTOW.